



Healing of periodontal tissue assisted by Coenzyme Q₁₀ with Vitamin E – clinical and laboratory evaluation

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Abstract:

The characteristics of the histopathological image of chronic periodontitis are alterations in the final section of blood vessels. Coenzyme Q₁₀ by the influence on the vascular wall may have a favorable effect on the improvement of the parodontium condition. Vitamin E intensifies the cell type response.

The aim of the research was evaluation of the parodontium condition after oral application of Coenzyme Q₁₀ with Vitamin E. Thirty patients with chronic periodontitis were examined. After the initial examination, scaling and root planning the hygiene indicators: plaque index (PII), interdental hygiene index (HYG), parodontium indicators: gingival index (GI), sulcus bleeding index (SBI) ± and measurement of the periodontal pockets depth (PPD) and clinical attachment loss (CAL) was performed. The patients have been taking the Coenzyme Q₁₀ with Vitamin E drug for two months. In this time the indicators were once again estimated and the measurement of the periodontal pockets depth was performed. The total antioxidant status (TAS) in the mixed saliva by the colorimetric method was determined twice.

The average value of PII decreased from 1.0 to 0.36, and the average value of HYG was reduced from 39.51% to 6.97% after two months of taking the medicine. The parodontium condition also improved. Average values of GI decreased from 0.68 to 0.18, and the values of SBI decreased from 7.26 to 0.87. Periodontal pockets shallowed by 30%. The laboratory examination result improved by 20%. Coenzyme Q₁₀ with Vitamin E has a beneficial effect on the periodontal tissue.

Key words:

periodontal disease, tocopherol, coenzyme Q₁₀, ubiquinol

Abbreviations: CAL – clinical attachment level, GI – gingival index, HYG – interdental hygiene index, PII – plaque index, PPD – probing pocket depth, SBI – sulcus bleeding index, TAS – total antioxidant status

Introduction

Coenzyme Q₁₀ is a compound which naturally occurs in human body and is synthesized in mitochondria

from phenylalanine and tyrosine. Its essential function is the participation in mitochondrial electron transport in the respiratory chain. The deficiency of coenzyme Q₁₀ leads to the dysfunction of the respiratory chain that is to insufficient production of highly energetic compounds which decreases the efficiency of cells [9]. Regardless of that fact, coenzyme Q₁₀ is one of the most significant lipid antioxidants, which prevents from generation of free radicals and modifications of proteins, lipids and DNA. In many disease conditions connected with increased generation and the action of

reactive oxygen species the concentration of coenzyme Q₁₀ in human body decreases [1, 2]. The clinical symptoms connected with the deficiency of coenzyme Q₁₀ may be eliminated by the pharmacological or diet supplementation as well as by administration of the vitamins of B complex [20], which significantly influence the increase in its synthesis. The indication for applying coenzyme Q₁₀ are: diseases of the cardiovascular system, periodontal diseases, diabetes, obesity and tumors [19]. The action of coenzyme Q₁₀ is indirectly connected with the coexistence in biological membranes with another lipophilic antioxidant, tocopherol [3]. The antioxidant effect of ubiquinol is not dependent on the presence of tocopherol. However the regeneration of biologically reduced active form of tocopherol happens under the influence of ubiquinol [5, 8]. It is recommended to apply these compounds simultaneously.

The aim of the research was evaluation of the periodontal condition after oral application of coenzyme Q₁₀ with vitamin E.

Materials and Methods

The preparation was applied to 30 patients with periodontal problems, 35–58 years old. All of them were healthy, non-smoking and without chronic diseases. All of the clinical investigations were approved by Bioethical Committee of the Medical University in Poznań, decision no. 1270/04 and were performed independently of any pharmaceutical companies. Periodontal diagnosis was determined after careful analysis of the case history and evaluation of the typical clinical signs and symptoms and the results of tests (indexes, PPD, CAL). The instruction of oral cavity hygiene was given after the subjective and objective examination was performed. Next scaling and root planning were done. A week after the clinical examination, the values of indicators: PII, HYG as well as GI and SBI were determined. The oral cavity hygiene of the examined patients was evaluated on the basis of two indicators: Plaque Index – PLI according to Silness, Loe [14] and HYG – Interdental Hygiene Index according to Loe [13]. The gingival condition was evaluated by clinical indicator Gingival Index – GI according to Loe, Silness [18] as well as by the indicator SBI – Sulcus Bleeding Index according to Muhlemann, Son [15]. The indicators were evaluated three

times: after scaling/root planning, after one and after two months of the application of coenzyme Q₁₀ with vitamin E. Next the gingival numbness, redness and consistency were recorded in the examination chart. The patients were asked to take the drug, at single dose 30 mg, twice per 24 h for 2 months. Furthermore, twice, before and after taking the preparation, basic periodontal parameters, like PPD (Probing Periodontal Depth) and CAL (Clinical Attachment Level) were assessed in the study. The examination was performed on six surfaces of all teeth using periodontal probe WHO 621, and the total antioxidant status-TAS in the mixed saliva was measured by the colorimetric method using random sample tests. The results were statistically analyzed in the Chair and Department of Computer Science Poznań University of Medical Sciences.

In the statistical analysis the Fisher-Freeman-Halton test was used. It was employed to examine the correlations between the parameters. In order to compare the indicators of oral cavity hygiene and periodontal condition, of the analyzed group, the nonparametric test of Kruskal-Wallis was used, additionally the Dunn analysis of contrasts was undertaken. The measurements were performed using the statistic package Statistica 6.0 and StatXact 4.0.1.

Results

The results of the examinations are compared in Tables. After two months of applying coenzyme Q₁₀ with vitamin E, the decrease in the values of oral cavity hygiene indicators PLI and HYG as well as parodontium indicators GI and SBI could be observed (Tab. 1). It has been confirmed by a statistical analysis at the significance level $p < 0.01$. The average value of PII decreased from 1.0 to 0.36, and the average value of HYG indicator was reduced from 39.51% to 6.97% after two months of taking the medicine. The condition of parodontium also improved. It became visible by the decreased values of GI and SBI indicators. Average values of GI decreased from 0.68 to 0.18, and average values of SBI from 7.26 to 0.87 after two months. In the clinical examination, after one month of applying the drug, the flushing receded. After two months, the gingiva visibly regained the correct colour and cohesion. The shallowing of periodontal pockets could also be noted (Tab. 2).

Tab. 1. Average values of the indicators of the oral cavity PLI, HYG and of the parodontium indicators GI, SBI in the examination 1, 2 and 3

Indicator	Examination	N	the Average	SD	Median	Min	Max
PLI	1	30	1.00	0.85	0.62	0.00	3.00
	2	30	0.60	0.58	0.50	0.00	2.00
	3	30	0.36	0.38	0.25	0.00	1.50
HYG %	1	30	39.51	27.49	39.00	0.00	100.00
	2	30	15.40	12.03	12.00	0.00	48.00
	3	30	6.97	4.34	8.00	0.00	16.00
GI	1	30	0.68	0.72	0.50	0.00	3.00
	2	30	0.46	0.57	0.50	0.00	2.50
	3	30	0.18	0.30	0.00	0.00	1.00
SBI	1	30	7.26	11.24	4.60	0.00	60.00
	2	30	1.90	3.65	0.00	0.00	12.00
	3	30	0.87	2.33	0.00	0.00	8.00

$p < 0.01$

The values of antioxidant potential in saliva did not change significantly and 0.15 ± 0.07 before the treatment, and to 0.18 ± 0.06 after two months of applying coenzyme Q10 with vitamin E.

Tab. 2. Average values of the depth of periodontal pockets and the loss of epithelial attachment

	N	PPD	CAL
Examination I	30	4.3	3.6
Examination II	30	3.0	2.3

In the interview, which was once again carried out after two months of treatment, patients reported: the improvement of their well-being, the decrease in gum bleeding while brushing teeth, pale gum and the subsidence of pain in ailments, gum itching as well as gum stinging. Furthermore, some patients, mainly women, informed of better skin and hair condition as well as increased appetite.

Discussion

We may conclude that according to the literature both preparations were applied to the patients in the supporting phase of the healing of periodontal diseases

[9]. However, we have not found any publications about the influence of coenzyme Q₁₀ with vitamin E on healing of periodontal tissues. There are some reports of usage of the drug in implantation. Favorable effect of coenzyme Q₁₀ and vitamin E on endothelium of the blood vessels [10] induced, already in the 1980s, many authors to start research of this drug combination on cardiovascular system [4–6, 11] as well as on oral cavity, mainly parodontium [2, 8, 9]. The results of the research were encouraging and suggested the possibility to use these drugs to support standard treatment procedures in certain diseases. In our research, the clinical pictures of parodontium significantly improved in the phase of active periodontal treatment. The hygiene indicators PII decreased by 64%, HYG by 82% as well as the parodontium indicators GI declined by 73% and SBI by 88%. The periodontal pockets shallowed by 30%. Similar results were noticed after topical application of coenzyme Q₁₀ [7]. Important were patients' statements in the interview, in the aspect of subjective feeling of the improvement of parodontium condition. It additionally confirms the effectiveness of applied supporting therapy. In our examination, the results of the evaluation of parodontium condition: indicator values, clinical picture and subjective feeling of the patients were more satisfying than the result of the laboratory examination of antioxidant potential TAS in the mixed saliva, which improved only by 20%. The TAS value was comparable with other studies [12]. The results

are consistent with the examinations of coenzyme Q₁₀ deficiency in gingival tissues by patients who suffer from periodontal disease [8, 16, 17]. Further detailed observation in a bigger group or in comparative groups seems to be justified, so that the supporting action of coenzyme Q₁₀ with vitamin E could also be demonstrated in laboratory examination.

Conclusions

On the basis of clinical evaluation we may conclude that the examined drug coenzyme Q₁₀ with vitamin E has a beneficial effect on the periodontal tissue.

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